

THE COST OF DELIVERING NUTRITION TREATMENT SERVICES FOR SEVERE WASTING IN LAO PDR

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BACKGROUND

Wasting is a form of malnutrition characterized by excessive thinness or low weight for height. Severe wasting increases child mortality risk up to 12 times and children who survive severe wasting may experience developmental problems throughout their lives. In Lao PDR, the average national prevalence of child wasting worsened from just under 6% in 2012 up to 9% in 2017.¹ Moreover, in three out of 18 provinces, the rates exceed the World Health Organisation (WHO) threshold² for being classified as a significant public health issue, highlighting the need for enhanced efforts to address the burden of wasting in Lao PDR.⁵

The Government of Lao PDR (GoL) has demonstrated an interest in the development of a national integrated management of acute malnutrition (IMAM) programme. The GoL made investments in 2018 to develop national guidelines and job aids, update the training package and deliver training sessions to provincial and district level personnel.⁴ Additionally, activities related to IMAM were integrated into the national reproductive, maternal, newborn, child and adolescent health (RMNCHA) strategy including the action plan for the development of a monitoring and evaluation framework. The inclusion of IMAM indicators in the District Health and Information System (DHIS2) is in process to improve the monitoring and reporting system.

The GoL has indicated a commitment to increase treatment coverage from 10% to 30% of the SAM burden by 2025.⁵ The IMAM program will be scaled up in provinces with high burden of acute malnutrition and implemented in selected health facilities, incorporating inpatient and outpatient care, and adopting a community approach for early identification and referral of children with severe acute malnutrition in the provinces of *Luangprabhang*, *Phongsaly*, *Savananakheth*, and *Attapeau* in the first phase, and ultimately providing IMAM services in 10 priority provinces by 2025.

Key to operationalising IMAM scale up plans is data on the cost so that sufficient financial resources can be



mobilised. Little information on the cost to implement an IMAM programme was available in the context of Lao PDR. Therefore, to generate cost data to support strategic resource allocation for the treatment of severe wasting, UNICEF carried out a costing exercise based on data collected from existing IMAM services nascent in Khamoune and Attapeu provinces. The goal of this costing study was to estimate the cost per child treated for wasting according to the national IMAM protocol and to estimate the total resource envelope required to progressively scale up service delivery according to GoL targets.

METHODS

This costing exercise used a bottom-up “ingredients approach”⁶ whereby the resources required to implement the IMAM program were identified, the number or volume of each required resource was estimated, and the unit cost of each item was determined. The total cost was then estimated by multiplying the total resources required by the unit cost of each resource. The identification of the cost “ingredients” was guided by the FANTA CMAM costing tool⁷ and primary and secondary data was collected on the volume of resources required and unit costs.

Data on resource usage was collected from four districts, Mahaxay and Yommalath districts in Khamoune province and Saysettha and Sanamxay districts in Attapeu province where IMAM services have been provided by the provincial and district health facilities since 2019. The costing team collected data relevant to the cost of community mobilization, outpatient treatment for uncomplicated cases,

and inpatient treatment for complicated cases and infants below six months of age, as well as above-facility level costs for overall program management and oversight. Primary and secondary data were collected through document review and key informant interviews. Most interviews were conducted by telephone given the restrictions on movement at the time of data collection due to the COVID-19 pandemic.

Resource use was estimated for the period of one year using 2019 as the reference year since service delivery was dramatically affected due to COVID-19, while unit cost data were collected in 2021 prices. Given that the provision of IMAM services is relatively new in Lao PDR, we relied heavily on normative guidelines⁸ and assumptions whenever primary program data were not available. Costing was done from an institutional perspective⁹ in that the costs borne by all agencies, NGOs, and government bodies were included while direct and indirect costs to child caregivers were not.

Collected data was entered into the FANTA CMAM costing tool¹⁰ which was heavily modified to better suit the requirements for this costing exercise. This costing tool aggregates the resource and cost data into nine categories, outlined in Table 1. Cost data were adjusted based on standard practices in economic evaluations.¹¹ Once data was entered into the costing tool, the costing team discussed anomalous results and identified any data entry errors or values that required reconsideration, particularly those based on normative assumptions. Uncertainty in the resource use estimates was not addressed for this exercise, nor was a sensitivity analysis carried out given the nascent status of the IMAM services and the provisional nature of the results of the cost analysis.

Table 1 Cost categories for the community-based management of child wasting

Cost category	Cost components	Primary data source
Treatment supplies (medical)	Medicines for treating infection, treating and preventing diarrhoea, deworming treatment, vitamin A, measles vaccinations, treating malaria, routine tests, IV kits and nasogastric tubes	UNICEF Supply Catalogue kit
Treatment supplies (other)	Therapeutic food (RUTF, F-75, F-100), non-consumable clinic supplies (scales, height boards, job aids, stationery, food preparation supplies, etc.)	Therapeutic food dosage charts and actual unit cost procurement; UNICEF Supply Catalogue kit
Supply logistics	Transportation and warehousing for therapeutic food and treatment medicines including fuel, loading/offloading, driver per diems, warehouse rental and maintenance, salaries and benefits of drivers and guards, etc.	Program documents
Training	Time of trainees, venue hire, refreshments, trainer fees, per diems, transportation, accommodation, training materials	Program documents
Community outreach	Salaries and benefits of outreach personnel or incentives for community workers/volunteers	GoL remuneration grids
Treatment personnel	Salaries and benefits of technical personnel at treatment clinic	GoL remuneration grids
Supervision	Salaries and benefits of supervision personnel; transportation for supervision visits	GoL remuneration grids
Management	Salaries and benefits of managerial personnel	GoL remuneration grids
Intermediate and Central level	Training, supply logistics, salaries and benefits of managerial personnel	Program documents

We modelled the cost of providing IMAM services at various scales of geographic reach and treatment coverage, guided by MoH scale up targets. The additional treatment coverage scenario targets are based on a progressive increase, reaching the global mean for treatment coverage (40%) and the SPHERE standards of treatment coverage in rural areas (50%).¹²

Cost efficiency, measured as the cost per child admitted for treatment, was also estimated for each geographic reach and treatment coverage scenario by dividing the estimated cost total by the number of admissions. The cost scenarios were projected based on the classification of each cost categories into the following types: 1) fixed based on number of cases treated, 2) variable based on number of cases treated, 3) fixed based on number of treatment sites, and 4) variable based on number of treatment sites.

RESULTS

Cost, cost-efficiency and cost drivers

Given that the data on actual admissions was not robust, upon consultation with government health care providers we assumed that 10% of the severe wasting burden was admitted for care¹³ and therefore 55 children were treated in Khamoune and 98 children in Attapeu were treated in the base case year, for a total of 153 children in the four districts included in this study of these two provinces¹⁴. Treatment services were provided in two inpatient care sites and 37 outpatient care sites and nutrition screening was conducted in 287 integrated outreach sites. An assumed total of 43 children were admitted for inpatient care before being transitioned to outpatient care after stabilization, and 110 children were admitted directly to outpatient care.¹⁵

At this scale, the **total cost** for one year of IMAM service provision is estimated to be \$68,700¹⁶. At an average of \$442 per child admitted for treatment¹⁷, the **cost-efficiency** of the IMAM program is at the high end of the range of typical values found within the literature, however this is to be expected for a nascent program implemented at a small scale with low treatment coverage.

The variation in cost per child treated in the two provinces is striking, with the average cost in the two districts in Khamoune at around \$659 per child treated and in the two districts in Attapeu it was nearly half that at just \$330 per child treated. This remarkable range in cost-efficiency for the two provinces is attributable primarily to the difference in burden and caseload¹⁸ and secondarily to the number of care sites. Nearly twice the number of children were treated in Attapeu in slightly fewer outpatient care sites and therefore greater economies of scale were realized in this province. Further improvement in cost-efficiency can be expected with an increase in treatment coverage. These results underscore the need to exercise caution when making cost-efficiency comparisons across contexts with differing disease epidemiology and population density, and the importance of contextual information for the interpretation of results.

Predictably, the cost per day of care in an inpatient setting for complicated cases is significantly higher than in an outpatient setting primarily due to the difference in staff time allocation requirements, underscoring the potential cost-savings of early detection. Overall, the need for an inpatient stabilization period adds an additional \$100 to the total cost of treating a child for severe wasting compared to outpatient care only.

Table 2 Cost and cost-efficiency, overall and by province

	Khamoune ¹	Attapeu ²	Total ³
Number of children admitted	55	98	153
Inpatient care treatment sites	1	1	2
Outpatient care treatment sites	20	17	37
Community outreach catchment areas for screening	192	95	287
Total cost (\$US)	\$36,400	\$32,200	\$68,700
Cost per child admitted for treatment, average (\$US)	\$659	\$330	\$449

¹ Mahaxay and Yommalath districts - ² Saysettha and Sanamxay districts - ³ In all four districts in the study

Cost drivers are inherently relative, with the proportion of each cost driver influenced by the scale of program implementation as the balance of fixed and variable costs changes (Table 3). In this smallscale program, the training of community outreach personnel was a key cost driver, yet it is expected that the proportion of total cost will dramatically decline for a more mature program implemented at a larger scale since this cost is independent from the caseload. Furthermore, since the IMAM training was conducted as a standalone session, there is likely the

potential to further reduce the cost of this activity in the future should IMAM training be integrated into basic training for health and nutrition service delivery personnel. The proportion of cost for outpatient care site fixed supplies is also likely to decline significantly for larger, more mature program¹⁹. As expected, the value of personnel time²⁰ providing treatment services and the cost of therapeutic food are key cost drivers. The share of these two categories as a proportion of total cost will increase as treatment coverage increases due to their direct relationship with caseload.

Table 2 Cost and cost-efficiency, overall and by province

Program activity ¹	Proportion of total ²
Training	31%
Community outreach training – trainee per diem	11%
Community outreach training – refreshments	6%
Community outreach training – training materials	2%
Operations and supplies	30%
Outpatient care site – fixed supplies	28%
Inpatient care site – medical supplies	1%
Inpatient care site – fixed supplies	1%
Personnel	23%
Outpatient care site – senior staff, treatment	6%
Outpatient care site – junior staff, treatment	6%
Outpatient care site – senior staff, internal supervision	3%
Therapeutic food and logistics	14%
RUTF	12%
Transport of therapeutic food	2%
F-75 and F-100	0%

¹ Only the top three sub-activities are listed here; a full list can be provided upon request.

² The sum of the main program activities does not total to 100% due to rounding errors.

Cost modelling

The total envelope of annual financial resources required to implement IMAM at multiple scales of geographic reach and treatment coverage in Kammoune and Attapeu provinces are presented in Table 4. To reach the GoL target of 30% treatment coverage in 30% of all health care sites in Kammoune and Attapeu provinces would require an investment of \$120,000, reaching 484 children with SAM at an average cost of \$245 per child. While an investment of \$179,000 would bring IMAM services in line with global averages of approximately 40% geographic and treatment coverage, reaching 825 children in need of care.

Table 4 Annual cost projections based on treatment coverage and geographic reach, Kammoune and Attapeu provinces¹

		Treatment coverage (of total burden)			
		20%	30%	40%	50%
Geographic reach	25%	\$81,000	\$97,000	\$114,000	\$130,000
	30%	\$100,000	\$120,000	\$140,000	\$159,000
	40%	\$129,000	\$154,000	\$179,000	\$204,000
	50%	\$163,000	\$196,000	\$228,000	\$260,000

¹ Estimates are rounded to the nearest \$1,000.

The GoL aims to increase the treatment coverage of the nascent IMAM programme by 5% annually reaching 30% treatment coverage by 2021. Assuming the same disease epidemiology across the entire country, Table 5 presents the cost and cost-efficiency estimates for multiple treatment coverage targets based on providing IMAM services in 20 priority districts in 10 key provinces assuming 100% geographic coverage within the targeted districts, as well as nation-wide assuming 20% geographic coverage.

To reach GoL IMAM target of 30% treatment coverage in 20 priority districts in 10 provinces would require an investment of \$503,000 at a cost of \$175 per child admitted for care, reaching 2,884 severely wasted children. Providing care to 30% of the burden in 20% of all potential care sites nationwide would cost an estimated \$777,000, treating 4,205 children with severe wasting at a cost of \$185 per child.

Note that since some costs are independent from the number of children treated (e.g., equipment for a care site), the cost per child does not scale linearly. There

Table 5 Annual cost projections and cost per child treated based on treatment coverage, 20 priority districts and nationwide¹

	Treatment coverage (of total burden)			
	20%	30%	40%	50%
Priority districts total cost²	\$389,000	\$503,000	\$618,000	\$733,000
Cost per child treated	\$202	\$175	\$161	\$153
Nation-wide total cost³	\$610,000	\$777,000	\$945,000	\$1,112,000
Cost per child treated	\$217	\$185	\$168	\$159

¹ Estimates are rounded to the nearest \$1,000.

² 20 districts represent approximately 22% geographic coverage in the 10 key provinces; assumes a burden of 9,612 cases.

³ Assumes reaching the global average of 40% geographic reach nation-wide and a burden of 70,088 cases.

are greater cost-efficiency improvements through improving treatment coverage and virtually no cost efficiencies gained by increasing geographic coverage; however, it is necessary to increase geographic coverage in order to continue to improve treatment coverage. For the sake of simplicity, the above modelling assumes an even geographic distribution of the estimated burden, while we acknowledge that some districts carry a higher burden than others.

Cost efficiency can be significantly improved by increasing treatment coverage within the existing health facilities that are providing care. Doubling the treatment coverage from 10% to 20% of the burden translates into a 38% cost-efficiency improvement, and reaching the global mean of 40% coverage would mean a cost efficiency improvement of approximately 57%. However, the assumptions around which scaled up cost estimates are built need to carefully assessed. These models of potential cost-efficiencies gained are dependent on factors related to population density of districts, terrain, ease of access to health facilities and distance of communities to treatment sites are all important in the actual costs to deliver the IMAM program, but these were beyond the scope of this analysis to include in the models.

Limitations

There are two main limitations to this costing exercise. First, it was necessary to rely heavily on assumptions of the quantity of resources required to implement the IMAM activities because the program was still relatively small and immature at the time of data collection. Consequently, the results presented here should be viewed as provisional but nonetheless useful for informing policy decisions around resource allocation, mobilizing financial resources, and determining scale up priorities. Extrapolations of

these estimates to other provinces should be done with caution, particularly in those with different geographic contexts that affect access, such as areas with much higher or lower population densities or child wasting prevalence rates.

Second, while additional financial resources may indeed be required to improve treatment coverage, we have assumed that any potential additional cost may be counterbalanced by improvements in cost-efficiency by greater economies of scale in a larger program, and through the maturation and integration of the program into basic health services. Therefore, the efficiency projections should be considered indicative rather than definitive.

DISCUSSION

At an average cost of just over \$400 per child treated, the cost-efficiency of the current, small scale IMAM program is poor compared to global averages.²² However, if the program were to improve treatment coverage up to the GoL target of 30% of the burden, the average cost is estimated to be approximately \$153-217 per child depending on the program scale, which compares much more favorably to the values reported in the literature. It should be noted that there are no economies of scale when expanding the number of sites offering care, and that all economies of scale are found when increasing the treatment coverage. Yet, equity in the provision of life-saving care should be a factor to consider when determining health priorities and resource allocation.

The provisional results of this costing exercise demonstrate that a modest annual investment of \$503,000 is what would be required to provide IMAM services to treat nearly 3000 children suffering from severe wasting in 20 priority districts in 10 key provinces, assuming 30% treatment coverage. While an annual investment of \$618,00 would be enough to allow Lao PDR to reach the global coverage mean, and \$733,000 would be required to reach the SPHERE standard of 50% coverage for rural areas.

It is possible that as the IMAM program is scaled up and integrated fully into MoH basic services there may be opportunities for decreasing cost and improving cost-efficiency that are not captured in the cost modeling presented here. Furthermore, there are potential cost savings that can be achieved through a reduction in the need for inpatient stabilization, which supports the assertion that early detection and referral are key components to a robust IMAM program. We estimate that given the same budgetary envelope, one additional child could be treated in an outpatient capacity for every 2.5-4.4 inpatient cases averted, depending on program scale and coverage.

Recommendations and Reflections

Based on the findings from this costing exercise, it is strongly recommended that wasting treatment scale up efforts should be focused on increasing treatment coverage in the highest burden areas of the country. This will maximize cost-efficiency and increase the number of children that can be treated within the available fiscal space. Nonetheless, equity in service

provision should remain among the considerations when strategizing the allocation of limited resources and the inherent trade-offs between maximizing value for money and ensuring equitable access to services can be challenging to navigate.

Future costing exercises should be considered to refine these provisional results by replacing normative assumptions with empirical data collected from a mature program carried out at a larger scale. Such improvements will lead to more robust and reliable results that can be used to parse out more detailed recommendations for opportunities to improve program implementation.

¹ Lao Social Indicator Survey (LSIS) 2017 <https://www.unicef.org/laos/reports/laos-social-indicator-survey-lsis-2017>

² WHO Nutrition Landscape Information System <https://apps.who.int/nutrition/landscape/help.aspx?menu=0&helpid=391&lang=EN>

³ Lao Social Indicator Survey (LSIS) 2017 <https://www.unicef.org/laos/reports/laos-social-indicator-survey-lsis-2017>

⁴ National Guideline on Integrated Management of Acute Malnutrition (IMAM) https://resources.acutemalnutrition.org/Laos_IMAM_2018_PUBLIC.pdf

⁵ National Strategy & Action Plan for Integrated Services on Reproductive, Maternal, Newborn, Adolescent & Child Health; <http://www.laoshealth.org/assets/national-rmnch-strategy-2016-2025.pdf>

⁶ The other main costing method is a top-down approach whereby aggregate expenditures related to a past program are assumed to be the total cost. This value is then divided by the number of service units delivered to derive the cost per unit of service delivered. This approach has the advantage of being less time consuming than an ingredients approach but also has the disadvantage of typically being less accurate and lacks the ability to model changes in cost based on changes in program implementation. Most costing exercises typically employ both approaches depending on the kind and quality of data available.

⁷ Food and Nutrition Technical Assistance (FANTA) community management of acute malnutrition (CMAM), a precursor to the IMAM approach. See <https://www.fantaproject.org/tools/cmam-costing-tool>

⁸ National Guideline on Integrated Management of Acute Malnutrition (IMAM), Laos https://resources.acutemalnutrition.org/Laos_IMAM_2018_PUBLIC.pdf

⁹ Societal perspective, on the other hand, includes the direct and indirect costs to program beneficiaries and is a more comprehensive approach to understanding the sum of all costs. The inclusion of beneficiary costs may be relevant depending on the objectives of the costing study and how the results will be used. Given the purpose of this exercise it was deemed not necessary to be included.

¹⁰ <https://www.fantaproject.org/tools/cmam-costing-tool>

¹¹ Apart from items procured in US dollars, costs were collected in Lao kip and converted to 2020 US dollars at the exchange rate of 8,860 kip to the dollar. Costs were not adjusted for inflation because the time horizon was not longer than one year. The value of one year of usage for capital items for the inpatient and outpatient clinics was calculated, assuming either three or five years before replacement for each capital item.

¹² The global mean for geographic reach is estimated to be 43% (UNICEF/Coverage Monitoring Network/ACF International. 2012. The State of Global SAM Management Coverage 2012. New York & London, August 2012); Rogers, E., Myatt, M., Woodhead, S., Guerrero, S., and Alvarez, J.L. 2015. Coverage of community-based management of severe acute malnutrition programmes in twenty-one countries, 2012-2013. PLoS

One, 10(6): e0128666; <https://spherestandards.org/wp-content/uploads/Sphere-Handbook-2018-EN.pdf>

¹³ The RMNACH target for treatment coverage of SAM children is projected to be 10% in 2021 at national level <http://www.laoshealth.org/assets/national-rmnch-strategy-2016-2025.pdf>.

¹⁴ All estimates throughout this study of the number of children treated are based on multiplying the assumed treatment coverage by the estimated burden. The burden was estimated using the methodology outlined by Mark Myatt for the CMAM Forum (https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/caseload_cmam-june-2012.pdf).

¹⁵ Based on survey data on age disaggregation and assumptions on the proportion of children requiring inpatient care.

¹⁶ Assuming an uncertainty of +/- 20% the total cost could be between \$50,300-\$80,000.

¹⁷ With a low estimate of \$240 per child and a high estimate of \$455 per child.

¹⁸ This exercise assumed the same treatment coverage for both provinces (10%) but the assessed prevalence of SAM varied. Khamoune was assessed at 2.3% and Attapeu at 4.2% in 2017. Lao Social Indicator Survey II 2017 <https://dhsprogram.com/pubs/pdf/FR356/FR356.pdf>

¹⁹ Since no primary data was available for local procurement of supplies required at care sites, we used the UNICEF Supply Catalogue (<https://supply.unicef.org/all-materials/nutrition/nutrition-kits.html>) for both inpatient and outpatient care site equipment, registration supplies and medical supplies and included only the value of one year of usage of an assumed 7 year lifespan for each kit.

²⁰ The value of personnel time was estimated based on average salaries and the estimated time spent directly related to IMAM services.

²¹ National Strategy & Action Plan for Integrated Services on Reproductive, Maternal, Newborn, Adolescent & Child Health 2016-2025. <http://www.laoshealth.org/assets/national-rmnch-strategy-2016-2025.pdf>

²² Chui et al. 2020. The cost-efficiency and cost-effectiveness of the management of wasting in children: A review of the evidence, approaches, and lessons. <https://www.acutemalnutrition.org/en/resource-library/3DI76SD-mJn5lIRGm8rk4ry>

